

was followed in December, 1855, and February, 1856, by papers on "Faraday's Lines of Force." In 1857 he obtained the Adams Prize, in the University of Cambridge, for his paper on the "Motions of Saturnian Rings." His paper on the "Theory of Compound Colours, and the Relations of the Colours of the Spectrum," which was chiefly instrumental in gaining the Rumford Medal, was read before the Royal Society on March 22, 1860. His "Dynamical Theory of the Electromagnetic Field," including a brief sketch of the Electromagnetic Theory of Light, was read before the Royal Society on December 8, 1864. The results of Clerk Maxwell's experiments on "The Viscosity and Internal Friction of Air and other Gases," were made known to the Royal Society in the Bakerian Lecture read, February 8, 1866. Then follow his Royal Society papers "On the Dynamical Theory of Gases," in May, 1866, and "On a Method of Making a direct Comparison of Electrostatic with Electromagnetic Force, with a Note on the Electromagnetic Theory of Light," in June, 1868. Lately he took great interest in Graphical Statics, and contributed a long paper "On Reciprocal Figures, Frames and Diagrams of Forces," to the Royal Society of Edinburgh, in December, 1869. Among his most recent papers are a paper on "Stresses in Rarefied Gases arising from Inequalities of Temperature," read before the Royal Society on April 11, 1878, and a paper on "Boltzmann's Theorem," read before the Cambridge Philosophical Society. It would take too long to enumerate his articles and reviews published in the *Philosophical Magazine* and in *NATURE*. His contributions to the ninth edition of the "Encyclopædia Britannica" include the articles "Atom," "Attraction," "Capillary Action," "Constitution of Bodies," "Diagrams," "Diffusion," "Ether," "Faraday," and "Harmonic Analysis." "Harmonic Analysis" was the last article he wrote.

One of the most remarkable of his works is the recently-published volume of the Electrical Researches of the Hon. Henry Cavendish, of which Prof. Maxwell is the editor. The MSS. are in the possession of the Duke of Devonshire, and are now at Chatsworth. They were entrusted by him to Prof. Maxwell shortly after the completion of the Cavendish Laboratory. Some of Cavendish's experiments were repeated by Prof. Maxwell with all the appliances of modern apparatus, and others were carried out by his pupils.

Most of the apparatus which he employed in his researches has been presented by Prof. Clerk Maxwell to the Cavendish Laboratory, together with many of his books. He always regarded the laboratory with great affection, and the University owes much to his liberality. One of the most interesting pieces of his handy-work now preserved in the laboratory is a plaster model of Prof. Willard Gibbs's thermodynamic surface, described in the fourth edition of "Maxwell's Theory of Heat." All the lines on the surface are drawn by his own hand, many of them being mapped out by placing the surface obliquely in the sunshine and marking the boundary between light and shade. Another valuable model constructed while Prof. Maxwell was at Cambridge is his dynamical illustration of the action of an induction coil in which two wheels represent by their rotation the primary and secondary currents respectively, the wheels being connected through a differential gearing to which a body of great moment of inertia is attached, the rotation of which represents the magnetism of the coil. A friction break represents resistance, and a spring may be attached to the secondary wheel to represent the capacity of a condenser placed in the secondary circuit. Among other valuable pieces of apparatus presented by Prof. Maxwell to the laboratory are the receiver, plates, and inertia bar employed in his researches on the viscosity of air and other gases, his colour-top, portions of the "colour-box," including the variable slits, with the wedge for measuring their width, a polariser and analyser made

of thin films of stretched gutta percha, the mechanism for illustrating the motion of Saturnian rings, a real image stereoscope, and the dynamical top, whose moments of inertia about three axes, which are at right angles to each other, can be so varied by means of screws that the axis of rotation can be made that of greatest or of least moment of inertia. When the axis of rotation is the mean axis, the motion of the top is, of course, unstable. When Prof. Maxwell came to Cambridge in 1857 to take his M.A. degree, he brought this top with him from Aberdeen. In the evening he showed it to a party of friends in college, who left the top spinning in his room. Next morning he espied one of these friends coming across the court, so jumping out of bed, he started the top anew, and retired between the sheets. The reader can well supply the rest of the story for himself. It is only necessary to add that the plot was completely successful.

Prof. Clerk Maxwell's papers will be placed in the hands of Prof. Stokes, who is one of his executors, in order that they may be published or catalogued and preserved in such a way as to be readily available to those wishing to consult them.

The death of James Clerk Maxwell is a loss to his University and to the world too great for words. He rests from his labours, but his works will follow him.

WM. GARNETT

NOTES

THE following is the list of officers to be proposed at the anniversary meeting of the Royal Society on December 1:—President—William Spottiswoode, M.A., D.C.L., LL.D. Treasurer—John Evans, D.C.L., LL.D., V.P.S.A. Secretaries—Prof. George Gabriel Stokes, M.A., D.C.L., LL.D., Prof. Thomas Henry Huxley, LL.D. Foreign Secretary—Prof. Alexander William Williamson, Ph.D. Other Members of the Council—George Busk, V.P.L.S., Prof. Arthur Cayley, LL.D., Major-General Henry Clerk, R.A., Edwin Dunkin, F.R.A.S., Augustus G. Vernon Harcourt, F.C.S., Sir Joseph Dalton Hooker, C.B., K.C.S.I., D.C.L., John Whitaker Hulke, F.R.C.S., Lieut.-General Sir Henry Lefroy, C.B., William Newmarch, Inst. Fr. Corr., Prof. Alfred Newton, M.A., V.P.Z.S., Prof. William Odling, M.B., V.P.C.S., Sir James Paget, Bart., D.C.L., William Henry Perkin, Sec. C.S., Charles William Siemens, D.C.L., John Simon, C.B., D.C.L., Prof. John Tyndall, D.C.L., LL.D.

A MEMORIAL strongly recommending Lord Rayleigh's election (if he can be induced to become a candidate), to the Professorship of Experimental Physics at Cambridge, is in circulation. Lord Rayleigh's merits for such an appointment are perfectly well known to our readers. We understand that his election will be supported by many of the professoriate.

WE are pleased to hear that Prof. Sir Wyville Thomson is now much better, and able to conduct the correspondence in connection with the *Challenger* work.

THE death is announced, at Florence, of Miss Martha Charters Somerville, the only surviving daughter of Mrs. Mary Somerville, in her sixty-sixth year. Miss Somerville enjoyed a pension of 100*l.* a year, in recognition of the services rendered to science by her mother.

THE Royal Institution Christmas Lectures will be given by Prof. Tyndall. The subjects will be Water and Air.

ON Tuesday night Dr. W. W. Hunter, the Indian Director-General of Statistics, delivered a lecture at the Philosophical Institution of Edinburgh, on the subject of "What the English had done for India." Contrasting the present English condition of the country with what it has become, since we have had to do with it. Dr. Hunter showed that the improvements in the land, and in the lot of the people had been immense. We need

not refer here to the purely governmental improvements which have been made, by the substitution of a good government for a bad, or for no government at all. The peace and security which the poorest native now enjoys was unknown before. Much of the improvement which has taken place has been due to the introduction of science and its results into India. As the *Times* puts it in a leader on Dr. Hunter's address:—"A country which, in the natural course of things, seemed fated to be long shut out from the light of civilisation, or to receive tardily a few rays, was admitted at once into the full blaze of noonday. Other nations have been doomed to work out their civilisation with painful striving. But, thanks to her association with the West, India has had no such novitiate to undergo. All that Europe could teach or give has been made free to her without trouble or price. She has had no centuries of painful waiting, but has stepped at once into possession of all the accumulated intellectual wealth of the West. This has already borne fruits, and more must follow. Our Indian fellow-subjects are being rapidly familiarised with our language and books, and they eagerly drink in modern ideas. They study our philosophers, and talk with more or less intelligence of Mr. Darwin or Mr. Herbert Spencer. The names of our chief scientific men are as well known at Agra or Poona as in London. Our schools and colleges are the little leaven which will not fail to leaven the whole mass. The old intellectual idols and prejudices are already prostrate or tottering; and even were there no traces of a bridge or a road to tell of our sway, its history would be imperishably written in the intellectual revolution which we have swiftly effected."

DURING the last four years, *Science News* states, very little has been heard of the observatory to be built in California from the gift of Mr. James Lick, and the public has very generally supposed that nothing would come of the project. But there are now signs of a renewed activity on the part of the trustees, and evidence of an intention to carry the project through without further delay. In August last, Mr. S. W. Burnham, of Chicago, the well-known observer of double stars, was invited to spend a month or two on Mount Hamilton, with his telescope, in order to test the suitability of the mountain as a site for the proposed observatory. His reports were so favourable that Prof. Newcomb, on whose recommendation he was chosen for the work, visited the place himself in September. Both these gentlemen speak in the highest terms of the excellence of the astronomical conditions. Not only is almost every night perfectly clear, but, according to Mr. Burnham, bad seeing is almost unknown. Every night is such a one as he would consider superb at Chicago, and would only meet with two or three times a year. He discovered during his stay a number of new double stars, in portions of the sky which are further south than can be thoroughly examined in the comparatively bad atmosphere of stations this side of the Mississippi. The result of this exploration will give both the trustees and the public a new interest in the project, and it is supposed will lead the former to push the work on as rapidly as possible. If, as both the astronomers who have examined the site seem to suppose, its atmosphere is finer than that of any existing observatory, the result will be that the most powerful telescope in the world will be under the finest sky for employing its utmost capacity.

M. FEIL, the Paris glass-founder, has just received an unusual number of orders for large discs for the following observatories:—Pulkowa Observatory, 80 cm. diameter; Nice Observatory (Bischofsheim's gift), 76 cm.; Paris National Observatory, 73 cm.; Vienna Observatory, to be worked by Grubb, 70 cm.; Mr. Hilger for England, 52 cm.; and M. Salmicroghi, of Milan, 52 cm. The Nice Observatory object-glass will be worked by MM. Henry Brothers.

ON Thursday, November 4, took place at the French Ministry of Public Instruction, the first general meeting of the delegates of the Meteorological Commission. M. Jules Ferry was in the chair, and he prefaced the discussion by some remarks on the zeal exhibited by delegates and expressed the confidence felt by the Government in the ultimate success of so many efforts. M. Herve Mangon, the president of the Council of the Central Bureau, read a report on the work accomplished since the institution was created, and directed attention to a number of useful questions which up to that moment had been too much neglected. All the resolutions proposed which had been discussed in preliminary meetings were accepted. A number of delegates delivered addresses asking for the erection of new stations and the improvement of certain departments.

THE French Minister of Public Instruction has appointed a commission for arranging all the collections now located in the Trocadero, and creating out of these valuable elements an ethnographical museum.

UNDER date Rome, Sunday night, the *Daily News* correspondent telegraphs:—"Galvani in the act of touching with two different metals the lumbar nerves of a vivisected frog; such is the monument, admirably executed in marble, which his native city, Bologna, has this day dedicated in her busiest street to the great discoverer of animal electricity."

It is stated that the Bell Telephone Company have taken the first steps to bring an action against the Edison Telephone Company for infringement of patent in respect of the microphonic transmitter of hard carbon employed in the latest form of instrument. This transmitter, which is almost identical with the Blake microphone used by the Bell Company, is claimed by Edison, under the name of the *Inertia Telephone*, as one of the earliest forms of his carbon telephone.

THE programme of the Society of Arts for its 126th session has just been issued. It gives a list of the papers and lectures for the session, so far as they have been arranged. The following are the papers to be read at the evening meetings previous to Christmas:—November 26, "Suggestions for Dealing with the Sewage of London," by Major-General H. Y. D. Scott, C.B. F.R.S. December 3, "Apprenticeship: Scientific and Unscientific," by Silvanus P. Thompson, D.Sc., Professor of Applied Physics at University College, Bristol. December 10, "Art Vestiges in Afghanistan; the Results of some Recent Explorations in the Jellalabad Valley," by William Simpson. December 17, "The Panama Canal," by Capt. Bedford Pim, R.N., M.P. The dates of the papers after Christmas are not announced, but the following are among the subjects to be treated:—"Domestic Poisons," by Henry Carr; "Gas Furnaces and Kilns for Burning Pottery," by Herbert Guthrie, C.E.; "The Utilisation of Slag," by Charles Wood; "Art in Japan," by C. Pfounder; "The Trade and Commerce of the Yenisei," by Henry Seebohm; "Modern Autographic Printing Processes," by Thomas Bolas, F.C.S.; "The History of the Art of Bookbinding," by Henry B. Wheatley, F.S.A.; "Art Ironwork," by J. W. Singer; "The History of Musical Pitch," by A. J. Ellis, F.R.S.; "The Recent History of Explosive Agents," by Prof. Abel, C.B., F.R.S.; "Ireland and its Resources," by C. G. W. Lock; "The Future of Epping Forest," by William Paul, F.L.S. Three courses of "Cantor Lectures" are to be given. The first course is by Dr. Charles Graham, F.C.S., F.I.C., Professor of Chemical Technology at University College, London, on "The Chemistry of Bread and Bread-making;" the second on the "Manufacture of India-rubber and Gutta-percha," by Thomas Bolas, F.C.S.; the third by R. W. Edis, F.S.A., on "Art Decoration and Furniture." The first meeting of the session will be held on the 19th inst., when the opening address

will be delivered by Lord Alfred S. Churchill, chairman of the Council.

DR. HINCKS'S "History of the British Marine Polyzoa," upon which he has long been engaged, is nearly ready for publication; it will form two volumes, uniform with the same author's "Hydroid Zoophytes," and will be fully illustrated by drawings of all the known British species and more remarkable varieties of this hitherto almost undescribed class. The work will be published by Mr. Van Voorst.

MESSRS. BUNNY AND DAVIES, of Shrewsbury, have published a "Guide to the Botany, Ornithology, and Geology of Shrewsbury and its Vicinity," edited by Mr. W. Phillips, F.L.S.

THE freedom of the Leathersellers' Company has been conferred on Prof. Owen.

ON November 3, at 7.45 P.M., a magnificent meteor was observed at Strassburg, in the vicinity of Jupiter, travelling south-eastwards. The duration was four to five seconds. The meteor was coloured green, and left behind a luminous track.

IN his just published report on the trade of Newchwang, in Southern Manchuria, Mr. Consul Adkins mentions that he has in his possession a specimen of lead ore found in the neighbourhood, which contains about 90 per cent. of metal, and also one of copper from the same locality which is almost equally rich. An attempt is being made to get authority to work these mines with foreign appliances. There is an abundant supply of excellent coal close to the veins of metal, and were the mining industry once fairly started, the prosperity of Newchwang and the whole province would, in Mr. Adkins's opinion, become remarkable.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus erythraeus*) from India, presented by Mr. Thos. G. Anderson; a Common Barn Owl (*Strix flammea*), British, presented by Mr. F. Bagnall; a Vervet Monkey (*Cercopithecus lalandii*) from South Africa, a Mona Monkey (*Cercopithecus mona*) from West Africa, a Malbrouck Monkey (*Cercopithecus cynosurus*) from East Africa, deposited; two Moustache Monkeys (*Cercopithecus cephus*) from West Africa, an Axis Deer (*Cervus axis*) from India, a Quebec Marmot (*Arctomys monax*) from North America, a Common Weasel (*Mustela vulgaris*), British, two Boatbills (*Cancroma cochlearia*), two Variegated Bitterns (*Ardetta involucris*) from South America, a Common Night Heron (*Nycticorax griseus*). British, purchased.

METEOROLOGICAL NOTES

IN the *Meteorology of England* for the quarter ending June 30, Mr. Glaisher gives some interesting notes of the cold weather up to that date. The mean temperature of London for the quarter was 49°·5, being the lowest which has occurred during the corresponding period since 1837. The unusually protracted cold weather set in on October 27, 1878, and for the eight months ending June, 1879, the mean temperature was only 41°·6, being lower than any which has occurred in the present century since 1813-14, when the mean temperature of these eight months was only 40°·4. It was during this cold period that the Thames was frozen over and a fair held between London and Blackfriars Bridges. Mr. Glaisher appends a very valuable table showing the mean temperature of the eight months ending June for each year from 1771-72, from which it appears that five colder periods than that of the present year occurred towards the end of last century, viz., 40°·9, in 1794-95, 41°·2 in 1788-89, and 41°·3 in 1783-84, 1784-85, and again in 1796-97. The more frequent occurrence of a higher temperature during the colder half of the year in recent years as compared with what prevailed in the end of last century is pointed out. During the first six months of 1879 the rainfall about London has been exceptionally large, amounting to 17·30 inches, which is larger than has fallen in these months any year since 1815.

IN the *Transactions and Proceedings* of the Philosophical Society of Adelaide, South Australia, for 1877-78, there is an interesting paper by Mr. H. H. Hayter, Government Statist of Victoria, on the infantile mortality of our Australian colonies, based on the statistical returns from 1866 to 1877. During these twelve years the rates per annum of the mortality of infants under one year of age in proportion to 1,000 births were 155 in South Australia, 128 in Queensland, 125 in Victoria, 106 in New South Wales, 101 in New Zealand, and 103 in Tasmania. In each of the years South Australia stood at the top of the list, except in 1877, when the rate of its infantile mortality was slightly exceeded by that of Queensland. From a detailed statement of the causes of deaths of infants in South Australia for the three years 1873-74-75, it appears that of the 3,641 deaths which occurred during these years from all causes, no fewer than 2,249 were occasioned by bowel-complaints and their complications. The whole of this question, which is a vital one as affects the future of such of our colonies as are characterised by high summer temperature, can only be satisfactorily investigated by weekly or monthly statistics of deaths of infants from all causes taken in connection with the mean temperature and humidity of the air during the time. Thus the different summer temperatures and humidities of these colonies explain by far the larger proportion of the differences in the rates of their infantile mortality. All the differences, however, are not to be thus explained, and it is the investigation of these and the tracing of them to their causes which would likely lead to the adoption of improved sanitary and domestic arrangements.

WE have received from the Scottish Meteorological Society a communication from Mr. Thorlacius, their observer in the north-west of Iceland, in which he states that the spring there was stormy and cold, but that, in direct contrast to what has prevailed in the British Islands, the summer had been very fine and warm up to the date of writing (September 23), and the rainfall very small during June, July, and August. Pastures had, in consequence, suffered much, and the hay crop turned out to be generally a very poor one. This has, however, been to some extent counterbalanced by the admirable state in which the hay harvest has been secured, so that most can look forward to the coming winter without uneasiness, even though it should prove severe. Since April they have heard nothing of the Greenland ice, always a subject of no little anxiety in these parts, the ice having fortunately kept away from the coast of Iceland. The Danish man-of-war schooner *Ingolf*, Capt. Mourier, cruised this summer close to the coasts of Greenland, but could effect no landing, owing to a belt of ice he could not force his way through, which lay along the shore for a distance of from twelve to sixteen miles. The Captain sailed along the coast, taking several bearings by the way, from Stewart's Island to Cape Dow, or from 69° to 65° 30' lat. N., thus sailing in a south-westerly direction along the coast of Greenland, which lies opposite the north-west of Iceland, at a distance of about 120 nautical miles. This shore has not been previously explored, no one having probably ever had an opportunity of getting so close in shore before. The strait between Iceland and Greenland was this summer, which very rarely happens, quite open for navigation, except the inconsiderable belt of ice immediately outside the coast of Greenland. Capt. Mourier had special instructions from the Danish government in regard to this exploration, and it is considered likely that the explorations on this little-known coast will be resumed. These meteorological and geographical facts are important in relation to the more southerly course than usual recently taken by our European storms, and the easterly and northerly winds resulting therefrom, to which we owe the all but unexampled cold dull weather of the past twelve months.

THE "Results of Observations in Meteorology, Terrestrial Magnetism, &c., made in Victoria during 1876," under the superintendence of R. L. J. Ellery, have been received. The methods of making and reducing the observations are detailed at length in the preface. The chief feature of the Report is its purely statistical character, there being no attempt to state the outstanding points of interest in the meteorology of the year in this part of Australia. To some extent, however, this want is compensated for by there being given with each month's detailed results the averages for that month of pressure, temperature, humidity, and rainfall, calculated from all previous observations in the office—together with particularly full data of electrical phenomena, hail, snow, frost, fogs, hot winds, storms of winds, and heavy rainfalls of half an inch and upwards within the twenty-four hours at the thirty eight rain stations over the colony.